

kind of nightmare. It begins by personifying dust and makes "us dusts" utter a great deal of incoherent talk which changes somehow into the voice of the writer himself, who by and by fades into Prof. Tyndall, then into "a weekly paper, *Punch*," then through Hugh Miller and the Holy Scriptures into the familiar tones of Mr. Henry Woodward, F.R.S., who gives way to the dusts again, and so on. The first impression, too, deepens upon further perusal. One never can be quite sure who is speaking; whether the "we" is the editorial pronoun or marks the utterances of the personified dust-motes. Sometimes, indeed, by a kind of feeble and perhaps, unconscious pun, it means both the author and "us dusts;" as where a sentence begins (p. 107), "Of all the authorities we have ever rested on, Sir Charles Lyell has described mountain formation most accurately." Or again: "Mrs. Somerville is a favourite authoress; we seldom find a protracted rest upon her volumes." The writer seems to have made a very hearty meal on all kinds of miscellaneous geological and other scientific and literary food. The variety and amount of the viands have been too much for him. Hence the wild speculations, the grotesque theories, the pell-mell rush of changing subject through the 272 pages of this curious but dreary volume. So completely has the nightmare taken possession of the author that in his frenzy he forgets the composition of the very air he breathes, and sententiously announces that while "the earth consists of air, water, and dust," the "air is composed chiefly of oxygen, hydrogen, and carbonic-acid gases." We would venture to suggest a good application of oxygen and hydrogen in the form of a shower-bath as a corrective. The book closes most appropriately with a spiritualistic *séance*, at which the *dramatis personæ* are a Medium, Spirit of Socrates, and Dust. If the author would discard all this "plain language," as he is facetiously pleased to call it, and tell us in simple straightforward English what it is all about, we should be prepared calmly to listen to him, but no more such "Biographies of Dust!"

Chemical Physics. By N. N. Lubavin. First fascicule. St. Petersburg, 1876, 346 pp., in 8vo. (Russian.)

THE author has given in a handbook a description of the various physical phenomena which, without belonging to the true domain of chemistry, are nevertheless involved in all chemical processes, and which can adequately be described as physico-chemical. These phenomena, of the highest importance for the student of chemistry who is interested in the philosophy of his science, are dealt with at length by the author in a very lucid and plain style. Without discussing advanced theories, M. Lubavin, in this first fascicule (the second being in the press) gives us only facts, and in a condensed form much useful information. He has carefully read what has been published in this department in France and Germany, but is not very familiar with our English works, except through German or French translations.

Enumeracion de los Vertebrados Fósiles de España. Por Don Salvador Calderon. (Madrid: T. Fortanet, 1877.)

THIS is a reprint from the *Anal. de la Soc. Españ. de Hist. Nat.*, tom. v., of Señor Calderon's valuable catalogue of the vertebrate fossils hitherto discovered in Spain, with an introduction and accompanying remarks. As the catalogue and an abstract of the introduction to it have been published in the *Quarterly Journal* of the Geological Society of London during the present year, it will not be necessary for us to do more than to call attention to the appearance of the work in its more complete form. Some interesting questions are opened up by the author concerning the distribution of several interesting Miocene forms such as *Sivatherium*, *Hyænarctos*, and *Hipparion*.

* See also Proc. Roy. Soc. (March, 1876.) Vol. xxiv. p. 273.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Museum Reform

EVERY one who puts faith in museums as educational engines must be grateful to Prof. Boyd Dawkins for the article on this subject in the number of *NATURE* for May 31. That reform is pressing needed in most of our provincial museums is a proposition almost beyond question; but how such reform can be best effected is a subject open to any amount of discussion. The primary difficulty in organising a museum is usually a difficulty of finance. Money, which measures all things, measures the curator's power of procuring glass cases and suitable specimens. Where, then, the resources of a museum are very limited, the greatest amount of good will probably be effected by confining attention to the formation of local collections. Such work, being restricted within a narrow sphere, may be done thoroughly, even in the poorest museum. Yet it is work which will be valued by every true student of science. Prof. Blackie, in his "Self Culture," gives excellent advice when he says: "In order to assist in forming habits of observation in this age of locomotion I should advise young men never to omit visiting the local museums of any district, as often as they may have an opportunity; and when there to confine their attention generally to that one thing which is the most characteristic of the locality." Now it often happens that the things most characteristic of the locality are hardly thought worth exhibiting, and are precisely the things that we do not find in a provincial museum. Only last week I had occasion to visit a museum of thoroughly old-fashioned type, and to my surprise I found that the mineral industries of the neighbourhood, though of great importance, were absolutely unrepresented, whilst unlabelled curiosities collected from every quarter of the globe were heaped together in defiance of all principles of classification. It is true there is great temptation for a curator to display a little of everything, and a specimen from the Antipodes is no doubt regarded as a greater curiosity than a specimen from the neighbouring hills. But if a small museum is to have any educational value worth naming, its aims should be restricted, at least in the early stages of its development. Many museums undoubtedly teach too little by attempting to teach too much.

Perhaps the chief cause of unsatisfactory arrangement in so many museums is to be found in the difficulty of curatorship. Most museums naturally take their complexion from those who have charge of them; if the curator, for example, is a good entomologist, the collection of insects will be good; and so on. A general museum, indeed, needs a curator just a trifle less than omniscient. Even where each department is under charge of some honorary specialist, it by no means follows that the greatest educational value is got out of the collections. It seems to me that it would be an advantage, wherever practicable, to establish some kind of connection between the museum and the nearest college or other educational centre; assuming, of course, that it is a centre of liberal education where science asserts its proper position. Just as lectures teach principally through the ear, so museums teach through the medium of the eye; and those who have had most experience in oral teaching will probably be best qualified to assist in the oversight of an educational museum.

Another direction in which most museums imperatively need reform is in the simple matter of labelling. Too often the visitor leaves without carrying away much information, simply because he is unable to interpret what he has seen. A curator can therefore hardly be too free in the use of descriptive labels. Large labels, no doubt, occupy a good deal of space, and this can be ill spared in a crowded collection. Nevertheless, I believe it is far better to exhibit only half the number of specimens, fully telling their own tales, than to cram the cases with specimens unnamed or only meagrely described. If a museum is to be of real value educationally, it must be made as far as possible its own interpreter.

Scientific Club, Savile Row

F. W. RUDLER

I HOPE ventilation of this subject in the columns of *NATURE* will direct attention to the necessity of more systematic arrange-

ment, and that governors will seek to redeem these institutions from the mere curiosity shop style into which too many have developed, and to render them valuable educational instruments.

Interested in geology, I have been pleased, in occasional visits with pupils to our local museums, to note the gain to accurate knowledge as the diagrammatic illustration of the text-book is exchanged for the fuller teaching of fossil and specimen, and where, to chronological and stratigraphical plan, the characteristic fossils are indicated by special labels, and the time range shown by variously coloured mounts, the advantage is considerable. I would further suggest the desirability of numbering important objects, as in a picture gallery, and furnishing the visitor with an attractive catalogue. Where several museums exist in the same town could not the authorities, by mutual agreement, economise space and effort by division of labour, each one becoming to some extent exhaustive in a special direction?

In one of our best arranged museums I recently found, for pure want of room, Cambrian trilobites associated with basic rocks, and a fossil neatly stowed away in a case of Vesuvian products.

Bright, convenient, and well-keyed, our museums ought to increasingly attract students and gather in recruits from time to time from the inquiring public. A good supply should in this, as in some other educational difficulties, create demand, and stimulate public sentiment until our museums become so commodious and well-appointed as to bear comparison with the excellent models Prof. Dawkins refers to as established by our Continental neighbours; and the natural sciences gain in dignity amongst us until they enter into healthy rivalry with the elder and established studies of numbers and letters.

Manchester, June 2

WILLIAM GEE

I SEE with pleasure that Prof. Boyd Dawkins has again raised his voice urging the importance of museums as a means of education, but as there is one point regarding their management to which it may be useful to call attention, I shall be glad if you will allow me to do so through your pages.

Undoubtedly English museums compare most unfavourably with foreign ones, and this partly arises from the idea which is so prevalent that one man ought to be able to arrange and determine anything from New Zealand birds, plants, or fossils to a collection of Egyptian idols. The consequence is that we see such incongruities as were pointed out by Prof. Dawkins, to which I should like to add another, from one of the leading technical institutions of London; there a few years ago (and I suppose there are still), among building materials, some large Nummulites (a genus of fossil foraminifera), marked portions of brick made by the Israelites for the Egyptians when they were allowed no straw.

In a middle-sized foreign town in any of the other civilised countries of Europe there is a museum in charge of men who have given their attention to various branches of science; even in Italy, which is much behind in this matter of museums, we find in such towns as Turin a well-arranged museum with a considerable staff of curators, with the minerals in the hands of one man, the fossils in another, the vertebrates have, I believe, two or three of the staff to work at them, while the invertebrates are in the hands of another, and in the same way the historical and technical portions are no doubt under adequate management.

When we turn back to England we find such a humiliating thing as a town like Manchester with no museum worthy of a fourth-rate town.

It will no doubt be some time before their importance is fully recognised and therefore as museums are likely to be for a long time insufficiently manned, might it not be a great advantage if a number of local museums joined together to employ specialists to determine different groups? Such work might no doubt be done very cheaply, for such men would often be glad of the opportunity of so much material passing through their hands.

A naturalist who was making any group, such as corals or crustacea, his subject, might visit the museums and would in a very short time be able to determine and arrange the greater part of the local collection, and might have those which required further research sent up to London for investigation at leisure upon the completion of his tour.

Alderley Edge

ARTHUR WM. WATERS

The Antiquity of Man

HAVING carefully perused the proceedings that took place at the recent "Conference" on the subject of the antiquity of

man at the Anthropological Institute, I confess to a feeling of disappointment. I had looked, if not for new geological facts, at least for something novel in the treatment of what was already known, instead of which the geological speakers seem, for the most part, to have merely reiterated opinions with which their names have been for some time identified. Thus my able opponent, Prof. Boyd Dawkins, does no more than restate views and conclusions which have already been controverted more than once, and to which, therefore, I need not reply here, as in so doing I should be only summarising what has been stated at length elsewhere. Mr. Dawkins's "case" and my own are now so fully before our fellow-hammerers that we may be well content to leave them for judgment to the future—a future which is probably not far off. Prof. Prestwich, again, while quite open to conviction that man may have lived in England in pre-glacial times, is yet strongly of opinion that all the human relics hitherto obtained in the south of England are of *post-glacial* age, because they occur in deposits that overlie "the boulder-clay." Now this conclusion would certainly follow if it could be shown that the "chalky boulder-clay" of East Anglia represents, as Prof. Prestwich thinks it does, the glacial period. Unfortunately it only represents one phase of that period. There is an *older* boulder-clay than that "chalky till," and there are two separate boulder-clays which are *younger*, as Mr. S. V. Wood has demonstrated. The East Anglian chalky boulder-clay was laid down, as I believe, during the climax of glacial cold, and is consequently much older than the upper boulder-clays that occupy the surface of Scotland and the North of England. For the evidence which has weighed with me in coming to this conclusion I must refer Prof. Prestwich to the account of the English glacial deposits, which is given in the second edition of my work on the Ice Age. The proofs and argument are too long to recapitulate here. That the East Anglian chalky till belongs to a much more ancient date than the upper boulder clays of Yorkshire and the North, must strike any one who will take the trouble to compare them. The East Anglian deposit has been subjected to long-continued and powerful erosion, and everywhere bears the impress of extreme antiquity, while the younger tills of the North have a comparatively recent appearance. Nor is this by any means all, for between the accumulation of the chalky till and the formation of the most recent boulder-clay or till of the North there certainly intervened one mild inter-glacial period. (There were in reality, as I believe, two such periods.) Now during the "last inter-glacial period"—that, namely, which preceded the deposition of the youngest boulder-clay of Yorkshire and the North—there certainly existed a land-surface in England over which the pleistocene mammalia roamed. The proofs of this are found in certain fresh-water and estuarine deposits which are met with near Hull and elsewhere, and which have yielded mammalian remains, and thousands of *Cyrena fluminalis* and other shells. Prof. Prestwich has himself described these beds and classified them as *post-glacial*, partly because they repose upon boulder-clay and partly on account of their fossil contents. But since the date of Prof. Prestwich's visit to the locality in question, the section (near Burstwick) has been much better opened up, and now one may see *resting upon these so-called post-glacial deposits a thick mass of tumultuous boulder-clay*. This boulder-clay is in my opinion as truly the product of glacier-ice as any ground-moraine or till in Scotland, Norway, or Switzerland, and points to a time when all Scotland and the northern districts of England, down as far as the valley of the Humber, were shrouded in snow and ice.

With reference to the recent discoveries by Mr. Skertchly near Brandon, which Mr. Evans and Prof. Hughes have convinced themselves lend no support to the view that man is other than *post-glacial*, I would ask geologists to suspend their judgment until they have had an opportunity of hearing the other side. Let them exercise a little of that "caution" which Mr. Evans desiderates, and not too readily acquiesce in his and Prof. Hughes' ruling. Mr. Skertchly, who has mapped the ground about Brandon and Thetford, and whom we may suppose, therefore, to be more intimately acquainted with the geology of that district than either of his opponents, has no doubt that certain implement-bearing brick-earths are covered by boulder-clay *in situ*. I have also carefully examined the sections in question and feel quite sure that Mr. Skertchly is right, and that the overlying accumulation is a true glacial deposit, and an integral portion of the so-called chalky boulder-clay. Prof. Ramsay, who has likewise recently visited Brandon, is, I believe, of the same opinion. But the occurrence of flint implements underneath the chalky till of East Anglia is, after all, no proof that